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Expert System for Diagnosing Early Childhood Developmental Disorders with Certainty Factor Method

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Abstract

The purpose of this research is to design and build an expert system to diagnose the type of developmental disorder in children early using the certainty factor method. The method of data collection used in this study is observation, interviews, and library studies. The system was built with the Waterfall System Development Method. The stage of the Waterfall method is analysis, design, coding, and testing. This expert system is built using the PHP programming language and MySQL database. The result of this research was to successfully build an expert system to diagnose the type of developmental disorder in children early using the Certainty factor method to facilitate the user in diagnosing developmental disorders in the child quickly, efficiently, and without having to consult a pediatrician.

Keywords: expert system; certainty factor; children; Waterfall; website

1. Introduction

Each child will surely experience a growing period in his life. The childhood growth and development period are divided into four, namely the prenatal time of conception, the infancy of between 0-11 months, the period of children under 5 years (12-59 months), and the preschool period between 60-72 months. A child can be said to grow when the child has a change in the physical measured in quantity, while the development can be seen from the increased functions of the body more complex such as the ability of crude, smooth motion, speech and language, and socialization and independence[1]. If the child's mental growth is ripe then the child's emotion, thinking, and adaptation to the environment N will be good, but if the mental development is delayed, there will be a developmental disorder of the pervasive including Down Syndrom, mental retardation, Asperger Syndrom, Rett Syndrom, autistic and attention-centered and hyperactive disorder (GPPH) [2]. Children's growth takes place regularly, intertwined, and continuously starts from conception to adulthood. Although there are variations, each child will pass a specific pattern. Tanuwijaya describes the stages of growing children in two, namely prenatal and postnatal period. Each of these times has its characteristics and distinction in its anatomy, physiology, biochemistry, and character [3].

Several things can cause slow motor development. One of the causes of motor development disorder is muscular tonu disorder or neuromuscular disease. Children with cerebral palsies may experience limited motor development as a result of spasticity, athetosis, ataxia, or hypotonia. Spinal cord abnormalities such as spina bifida may also cause a delay in motor development. The neuromuscular disease Crate muscular Dystrophy shows a delay in walking ability. However, not always the disruption of motor development is necessarily based on the existence of the disease. Environmental factors, as well as child personalities, can also influence delays in motor development. Children who do not have the opportunity to learn as often carried may experience delays in achieving motor skills [4].

Table 1. Number of Children with Personality Disorders

No	Types of interference	Age	Amount
1	Mental retardation	4 years old	10 Children and boys
2	Passive autistic	3 years old	4 Child
3	Autistic hyperactivity	3.5 year	6 Children and boys
4	Conduct Disorder	4 years old	5 Children and boys
5	Adhd	5 years old	8 Children and boys

Table 1 shows the number of children with personality disorders. In the table, the most number of sufferers are mentally disabled sufferers. It is increasing the number of developmental disorders in children up to approximately 15-20 per 10,000 children[5]. If the birth rate in Indonesia is 4.6 million children, the number of children with developmental disruption of other children will increase by 0.15% or approximately 6,900 children experiencing developmental Disorders (Source: depkes.go.id). Many parents late knowing the abnormalities or disorders of his son because of the ignorance of the parents regarding the symptoms, it is necessary to make a system to help the problem.

Health is a valuable thing for people because anyone can experience health problems. Lack of sensitivity to the symptoms of a disease is a fear of itself[13]. In the event of health problems, they are more trusted to experts or experts who know more about health, regardless of whether the disturbance is still low or chronic. However, with the ease with the presence of experts or expert doctors, sometimes there are disadvantages such as limited working hours and the number of patients who have to wait for the queue. In this case, more needs an expert who can facilitate the diagnosis of the disease earlier. So, they can be able to do early precautions that if it takes time if they consult with an expert doctor[6][14].

The expert system is an Artificial Intelligence (AI) program that combines a knowledge base with the engine inference. The Program acts as a smart consultant or advisor in a particular skill environment. The basis of the expert system is how to move the knowledge possessed by an expert into the computer, and how to make decisions or to make conclusions based on that knowledge. As a result of the set of knowledge that has been gathered from some experts. One of the areas of application that is quite prominent in the expert system is the diagnosis process. This diagnosis process can also involve medical action, such as conducting a diagnosis of the type of developmental disorders in children[7][15][16].

One implementation that applied the expert system in psychology, which is an expert system to determine the type of child developmental disorder. Children are the most vulnerable and very noteworthy phases, one step after another. To find out whether the child is experiencing developmental disorders or not, a diagnosis is much needed. Developmental disorders in children can be diagnosed with some of the behaviors shown by the child by observing a child psychology expert. In making decisions often, an expert/psychologist analyzes the information that exists with such phrases as possible, most likely or almost specific[8][9]. To overcome this, the expert system is designed to diagnose Developmental disorders in children by describing the level percentage. This expert system will make it easier for people in particular (parents) to diagnose developmental disorders in children without having to go and consult a doctor so that more efficient time and cost[10][11].

2. Research Methods

2.1. Data Collection

The method of collecting data is a method of an interview with the Posyandu Staff on developmental disorders in children and symptoms. The study also implemented a library study method to obtain references from books, journals, articles and other documents related to research.

2.2. System Development

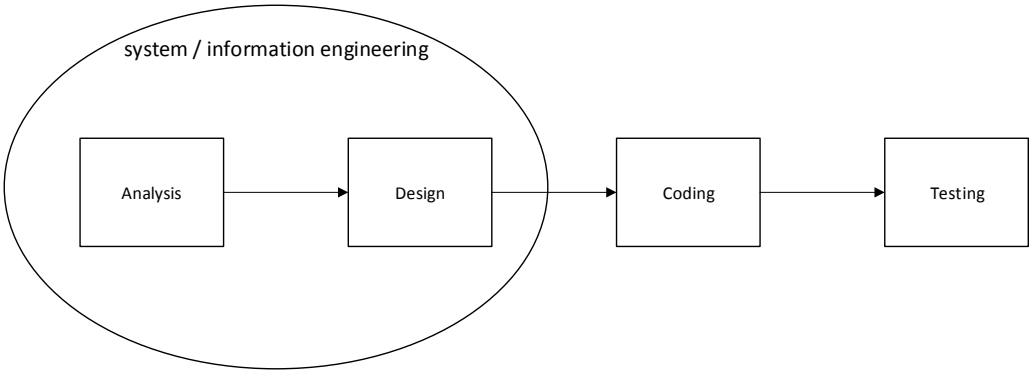

Fig. 1 Waterfall Method

Fig. 1 is a waterfall system development method, in the Waterfall method, consists of 4 stages, namely analysis, design, coding and testing.

3. Results and Discussion

An expert system for diagnosing childhood developmental Disorders is one of the solutions used to diagnose developmental disorders of the child early on.

In this study, the method used was the certainty factor method with the forward chaining inference machine (forward trace), where by this method can determine a symptom based on the high value of certainty factor. The number of impaired children in this research is 5 types of disorders with 30 symptoms.

3.1. Child Disruption Data

Table 2 Data Developmental Impairment in Children

Disease Code	Name of illness
P01	Mental retardation
P02	Passive Autistic
P03	Autistic Hyperactivity
P04	*Conduct Disorder*

3.2. Symptom Data

Table 3 Data Developmental Disorder Symptoms in Children
(Source: Posyandu Healthy Children of Purwokerto)

Symptom code	Symptom name
G01	Brain capabilities are very less
G02	Poor muscle coordination
G03	Difficult to speak smoothly
G04	Less expressive Facial
G05	Saliva often drips
G06	Slow learning and adapting
G07	Avoid eye and physical Contact
G08	Like to be alone
G09	Not much to talk
G10	Close away from others
G11	Not empathy for the conditions surrounding
G12	Often do Strange body language
G13	Changing activities
G14	Do not care for others
G15	The movement is excessive
G16	Very Active
G17	Communication Difficult
G18	Very hard to set
G19	Often angry and frightening others
G20	Love starting a physical brawl
G21	Glad to torture Animals
G22	Often use tools to threaten
G23	Behave aggressively
G24	Not listening to advice
G25	Can not sit still
G26	Often cut/interrupt Activities people
G27	Hard to be soothed
G28	Always act spontaneously without thinking
G29	Cannot Focus
G30	Can not control themselves

3.3. Application Creation

Data flow planning aims to determine the process of information that flows through the software. To describe the design is commonly used tools such as the context diagram (context diagram) and the Data Flow diagram (DFD).

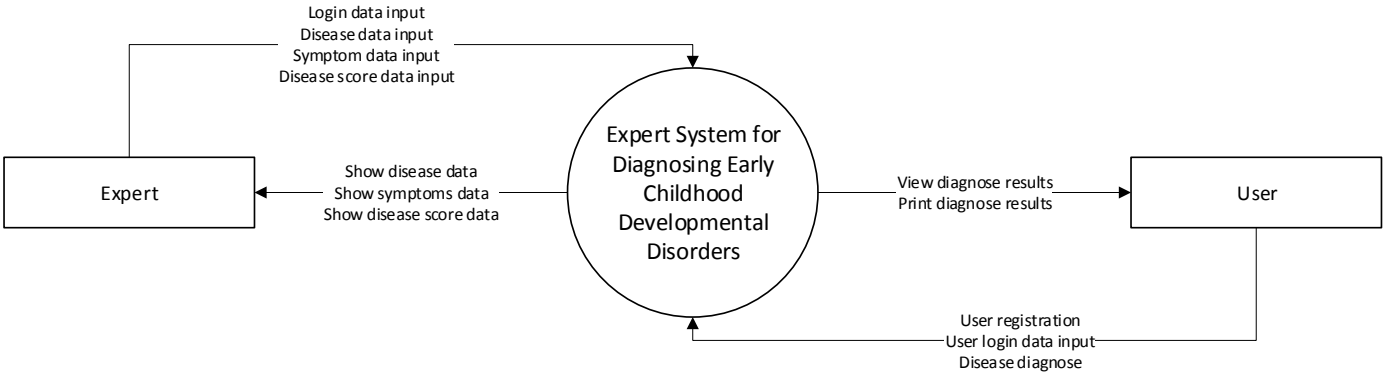

Fig. 2 DFD Context

Entity Relationship Diagram (ERD) is a diagram used to design a database that shows the relationship or relation between an entity or an object involved with its attributes[12]. ERD Diagram of The expert system for diagnosis of children's developmental disorders, as shown below:

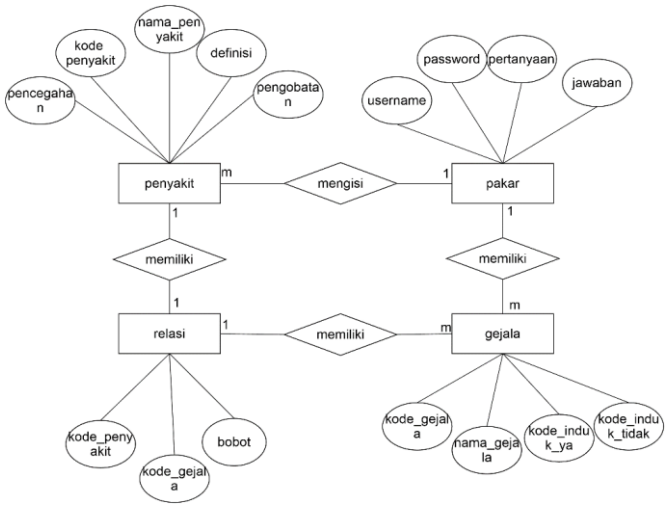

Fig. 3 Entity Relationship Diagram (ERD)

Fig 3 is the Entity-Relationship Diagram in the system of the early childhood diagnosis of children's developmental disorders with the certainty factor method.

3.4. System Implementation

a. Home page Application on expert systems

Fig. 4 Expert System Home Page

In Figure 4 is the main page of the root p system to diagnose early child developmental disorders with the certainty factor method.

b. Information page on the expert system

Fig. 5 Information Page

In Figure 5 is the information page display on the root p system to diagnose child developmental disorders early with the certainty factor method.

c. Help page on expert systems

Fig. 6 Help Page

Figure 6 is a help page display on the root p system to early diagnose child developmental disorders with the certainty factor method.

d. Admin Main Menu page on expert system

Fig. 7 Main Admin Menu

In Figure 7 is the Admin main Menu page display on the root P system to diagnose early child developmental disorders with the certainty factor method.

3.5. Testing

Table 4 Test Plan

No	Access	Test class	Test item	Test Type
1	Admin	Login	Data Verification	Blackbox
2	Admin	Data Password	Change data	Blackbox
3	Admin	Disease Data	Change data	Blackbox
4	Admin	Data Symptoms	Change data	Blackbox
5	Admin	Relationship Data	Change data	Blackbox

4. Conclusions and Suggestions

4.1. Conclusions

From the results of research that has been done to the expert System of diagnosis of Developmental disorders in children, then it can be concluded as follows:

a. This research has been the result of designing and building an expert system capable of diagnosing Developmental Disorders in children using the Metode inference certainty factor.

b. Symptoms related to developmental disorders in children In this study has been successfully represented in the rule to be understood by computer systems.

c. Based on the results of testing using BlackBox Testing It can be concluded that all functions in This expert system successfully run.

4.2. Suggestions

On the development of this Expert system, researchers advise the following:

a. The development of expert system applications in Subsequent research is expected based on recent research by many experts.

b. Expert system development in Subsequent research is recommended for Android-based applications.

c. Implementation of system the next expert with a more excellent and responsive display design For example, with M Etro UI, because it has the essence distinctive and exciting.

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